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JUL 30 2003

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

July 30, 2003

Marlene H Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W
Washington, D C. 20554

NOTICE OF EX PARTE PRESENTATION

Re: Permitted Ex Parte Presentation on the Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, IB Docket No. 00-248

Dear Secretary Dortch·

On July 29, 2003, staff and representatives of QUALCOMM, Inc. met with representatives of the International Bureau to discuss QUALCOMM's comments and reply comments in the above-referenced rulemaking proceeding. In attendance for the Federal Communications Commission were Thomas Tycz, Chief, Satellite Division, John Martin, Senior Engineer and Steven Spaeth, Policy Branch. In attendance for QUALCOMM, Inc. were Jonas Neihardt and Leonard Schiff, QUALCOMM, Inc., Jan King, Ecliptic Enterprises Corp., and Leslie Taylor, Leslie Taylor Associates, Inc., on behalf of QUALCOMM, Inc.

During the meeting QUALCOMM discussed its comments in the above-referenced proceeding and provided additional information concerning its proposed revisions to the Part 25 rules Attached is a copy of the slides provided during this presentation.

Please let me know if there are any questions concerning this matter

Sincerely yours,

Leslie A. Taylor

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List A B C D E

Cc: Thomas Tycz, Chief, Satellite Division
John Martin, Senior Engineer, Satellite Division
Steven Spaeth, Policy Branch

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Proposed Revisions to 47 CFR, Part 25 IB Docket No. 00-248

Proposals of QUALCOMM, Inc.

Presented to International Bureau
Federal Communications Commission
July 29, 2003

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QUALCOMM's FOCUS TODAY

- Statistical Methods Used to Address Adjacent Satellite Interference:
  - Ka-Band Terminals Routinely Processed:
    - Part 25.138(a) – Blanket Licensing Provisions
  - Contention Protocols vs. Classical Multiplexing Techniques (FDMA, TDMA and CDMA):
    - Part 25.138(a): ESD = 18.5 – 25 log θ – 10 log N
    - FNPRM at ¶79 and ¶88.
    - Exceedance Duration Issues
  - Extension of Rules to Other Bands (Ka-Band)
    - FNPRM at ¶101
    - *18 GHz Order,* FCC 00-212
- SIA Reply Comments Re Contention Protocols.

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What's Happening in the Marketplace?

- Two-way Broadband Connectivity in Urban and Suburban Homes is Growing Rapidly.
- Cable Companies have Created a Service Expectation for DTH Video bundled with High Speed Internet Access.
- A Strong Public Mandate Exists to Abolish the "Digital Divide."
- FSS Systems are the Only Practical Means of Providing Affordable Services to Non-Cabled Areas in the Foreseeable Future.
- QUALCOMM has been developing new technology for high-data rate FSS earth stations and is interested in entering the business.

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What is Happening with Broadband Technologies?

- Data Packet Switched Networks Are Beginning to Dominate Many Telecommunications Markets.
- Broadband Internet Connectivity is Being Provided by a Mix of Wireline, Satellite and Terrestrial RF Facilities.
- Networks Are Now Adaptive to:
  - User Demands
  - Instantaneous Network Conditions
  - Market Conditions
- Systems have Significant Data Rate Dynamics

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Why Statistical Methods Should be Employed to Address Interference in Future Telecom Systems

- In Order to Adapt to Dynamic Service and Data Rate Requirements, Methods Have Been Developed which:
  - Adjust Channel Conditions to User Demand
  - Account for Natural Variations in Traffic Level and Link Signal Conditions (e.g. Propagation)
  - Adapt to the Variable Delays Encountered When Connecting to the Internet

- THUS . . .

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Why Statistical Methods Should be Employed to Address Interference in Future Telecom Systems –(2)

- Data Rates Within a Channel Vary With Time.
- Data Rates of Users Sharing "Channels" (FDMA, TDMA or CDMA) and System Resources are Different Even at the Same Instant.
- Transmission Times and Delays Vary Within a Channel.
- EACH OF THESE FACTORS INTRODUCES ONE TO MANY RANDOM VARIABLES INTO THE DATA SYSTEM PROVIDING CONNECTIVITY.
- If Satellites are to Play a Major Role in Broadband Services They Must Adapt to and Support this Reality.

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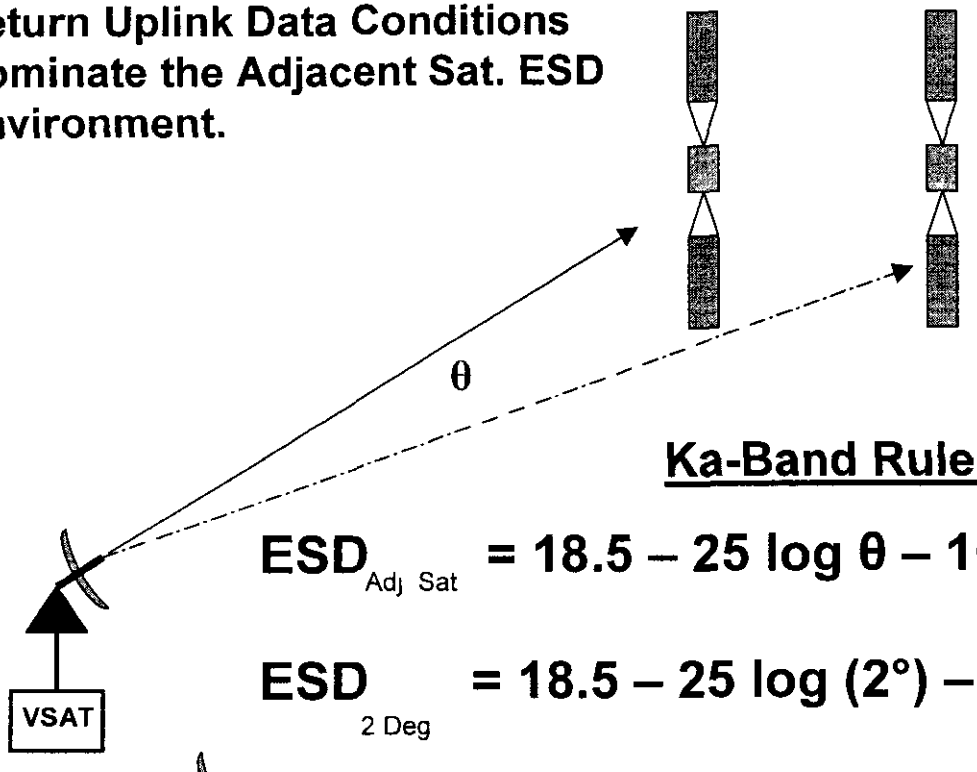
Key Issue for Broadband Satellite Systems: Routinely Processed VSAT Terminals

Return Uplink Data Conditions Dominate the Adjacent Sat. ESD Environment.



The Vast Quantity Of Terminals to be Utilized in Broadband Satellite Networks Can Only be Managed through <u>Routine Processing.</u>

<u>Ka-Band Rule:</u>

$$ESD_{Adj\ Sat} = 18.5 - 25 \log \theta - 10 \log N \quad [dBW/40\ kHz]$$

$$ESD_{2\ Deg} = 18.5 - 25 \log (2°) - 10 \log (1) = \boxed{11\ dBW/40\ kHz}$$

This is the Value Allowed for the SUM of all Uplinking Terminals SIMULTANEOUSLY Transmitting.

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Let's Examine "N"

- "N" is the "Likely Maximum Number" of Simultaneous Co-Frequency Emitters

- The "10 log (N)" term implies that

10

simultaneous

co-frequency emitters will have EQUAL and

constant power.

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Let's Examine "N"

"Likely Maximum Number" of Simultaneous Co-Frequency Emitters

- In contrast to the foregoing assumption, in a modern data network:
  - The power of each simultaneous co-frequency emitter can be different and each emitter's power changes with time (and appears as a random variable in the channel).
  - The number of simultaneous co-frequency emitters varies instant-by-instant (and is a random process).
  - The delays in transmission of data are not precisely known and are determined by random processes including those dictated by the Internet itself.

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Probability Density Function (PDF)

- Due to the summation of all random factors working within a broadband system, the power transmitted by the sum of all channel emitters varies with time and can be expressed by a probability density function (PDF).
  - In our example, we have shown the process as though the power were approximately NORMALLY distributed.
  - Other distribution functions are possible for different systems.

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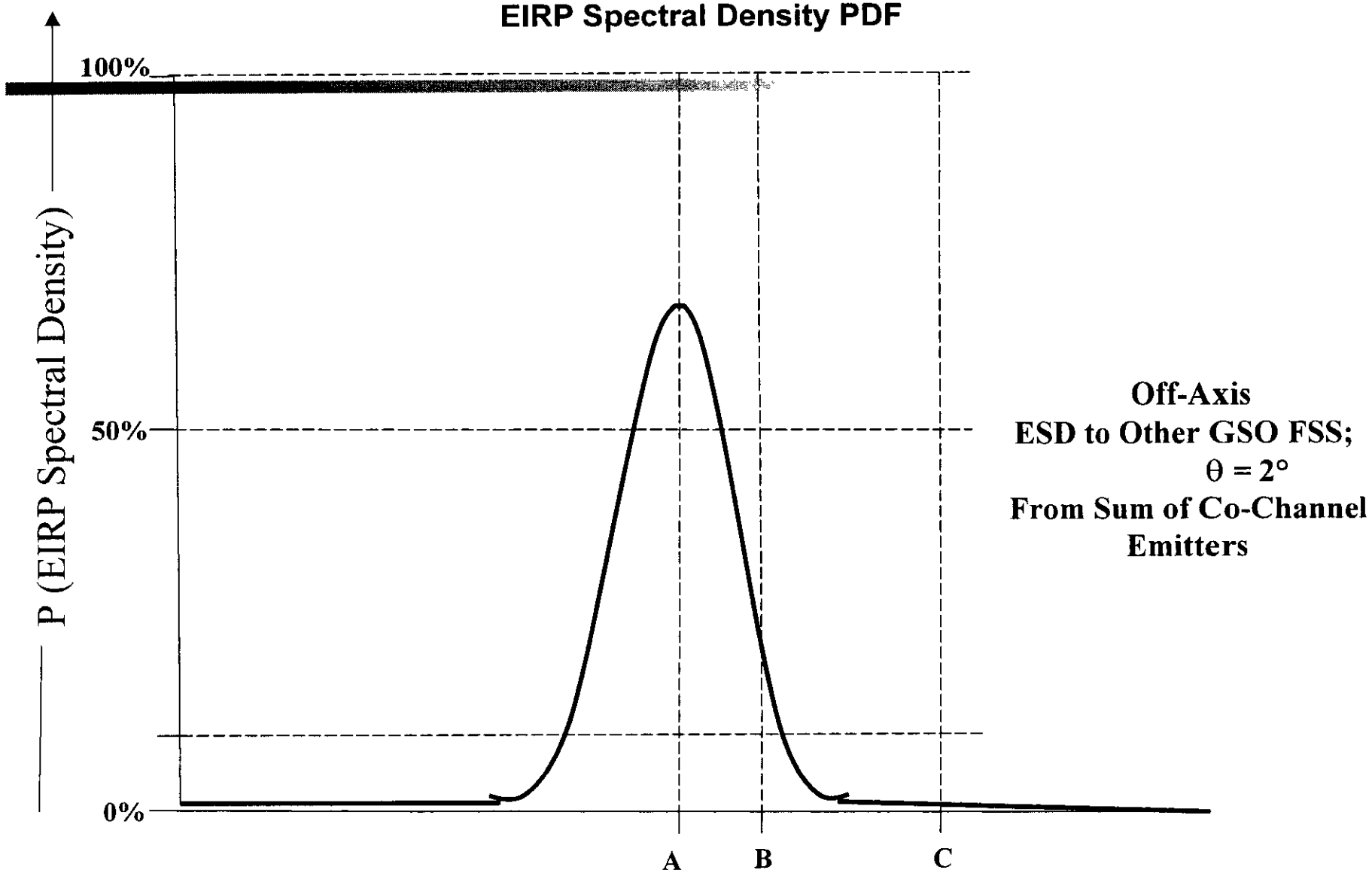
Simultaneous Co-Channel VSAT Terminal EIRP Spectral Density PDF

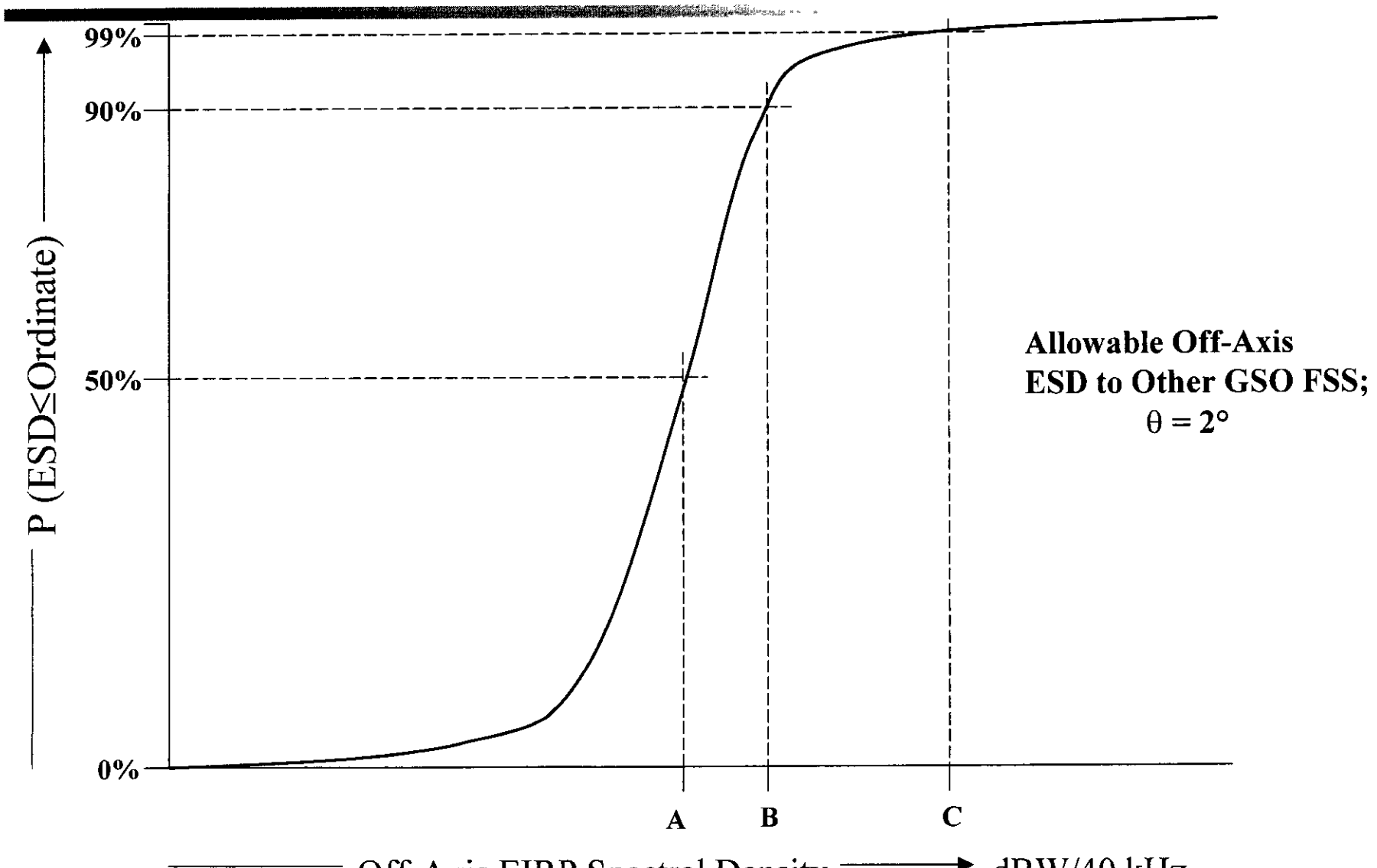


Example Probability Density Function

Cumulative Distribution Function (CDF)

- In communications problems it is often very useful to express the statistical behaviour of the system in terms of the mathematical *integral* of the PDF. This function is known as the Cumulative Distribution Function (or CDF).

- This function gives the probability (percentage of the time) that a certain power level (in this case, EIRP spectral density) will not be exceeded.



Example Cumulative Distribution Function

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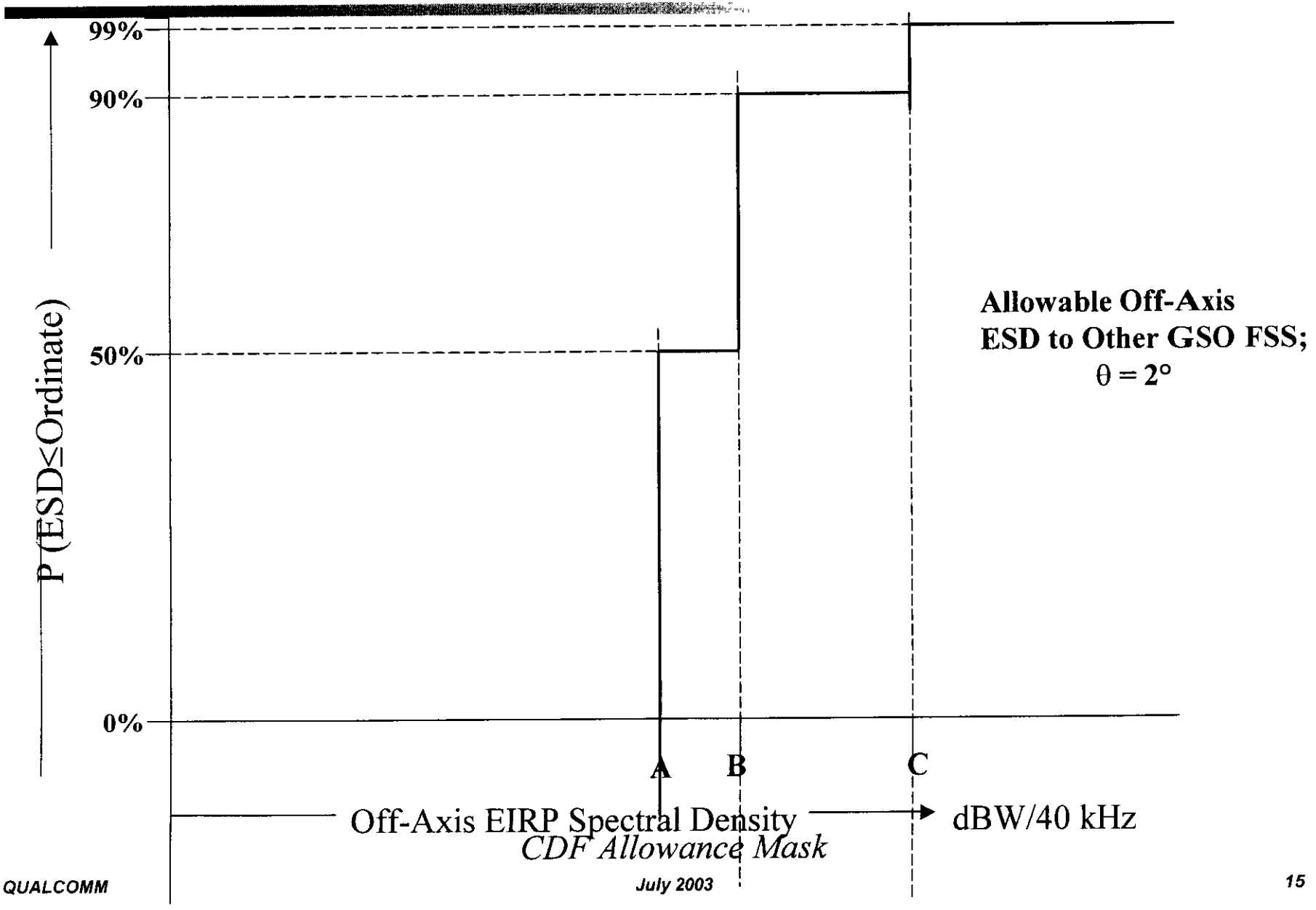
An Allowance Mask

- In order to formulate a regulation without using a complex mathematical relationship, an *Allowance Mask* may be used as we show here, by example.
- Similar allowance masks are used throughout CFR 47, in various places.
- By assigning discrete values where EIRP spectral density may not be exceeded, the rule format is simplified and may easily be put into words.



CDF Allowance Mask

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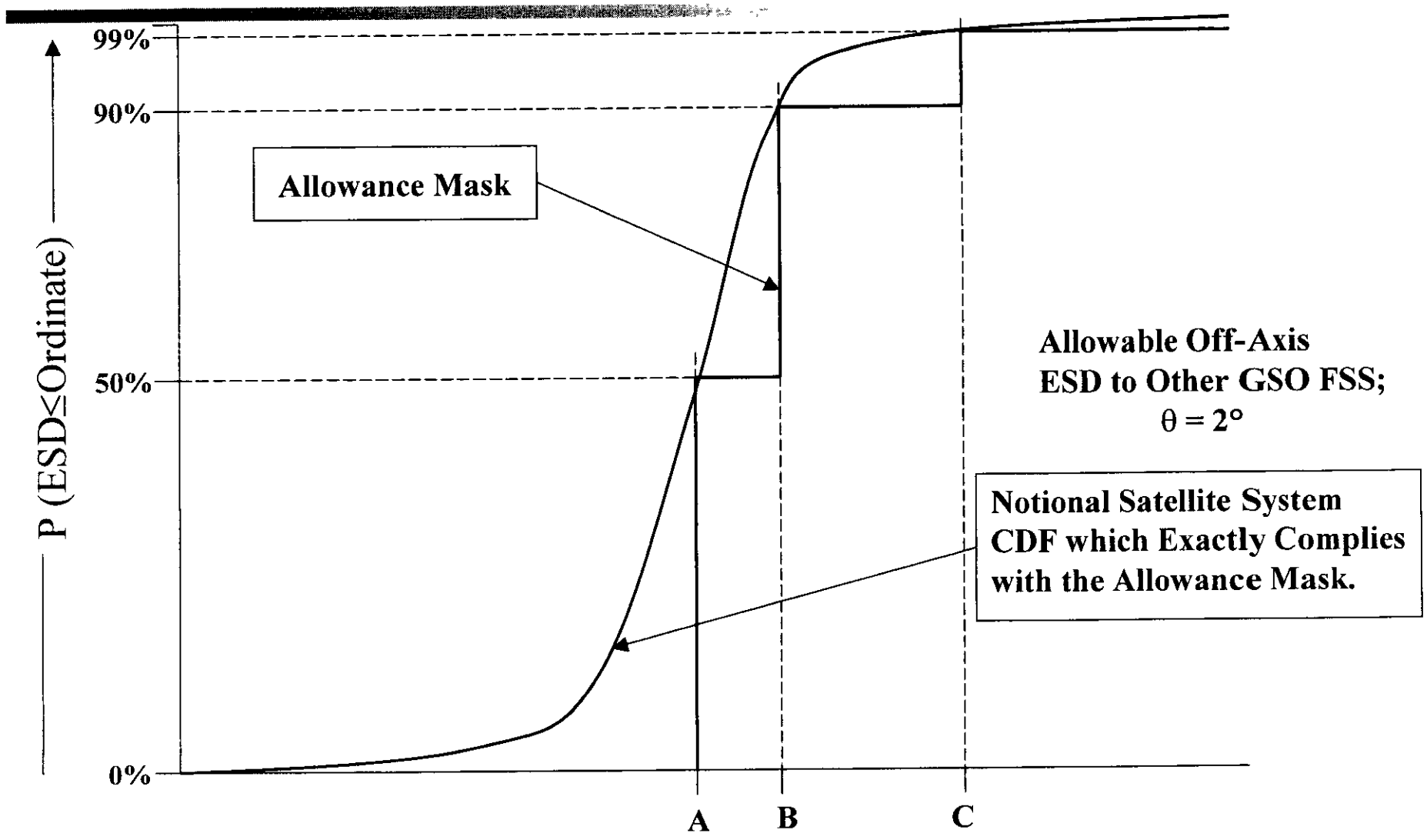
Compliance with the Allowance Mask

- Applicants may then develop satellite ground systems which make optimum utilization of the variables within their systems so long as they conform to the Allowance Mask.

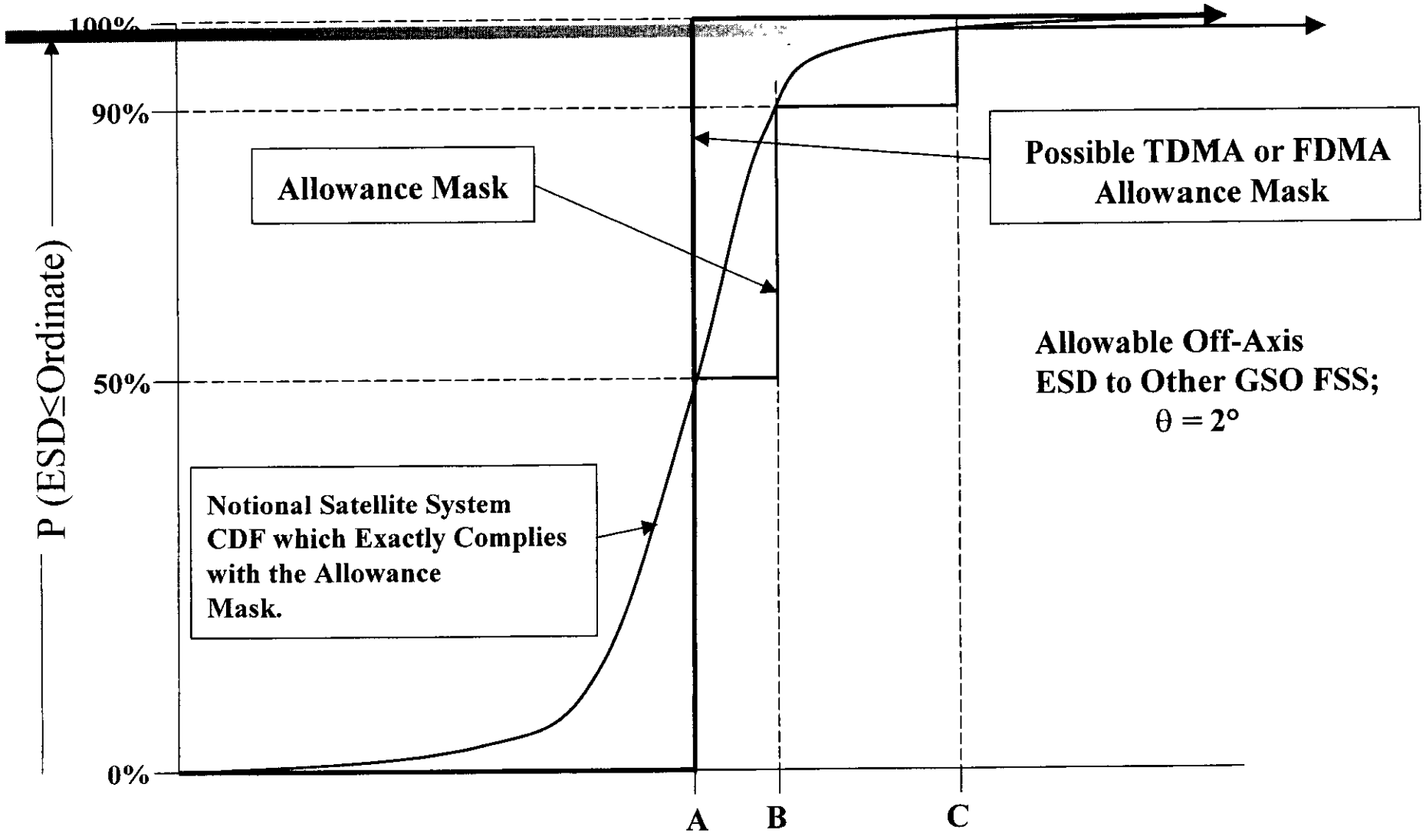


Application of the Allowance Mask to a Satellite System ESD CDF

QUALCOMM® Applicability to Other Multiplexing Techniques

- The proposed notional Allowance Mask is applicable for a system with a NORMALLY distributed ensemble of emitters within one channel.
- The Mask could also be complied with by systems using FDMA, TDMA and various forms of contention protocols (e.g. Aloha).
- TDMA and FDMA systems, because of the nature of their operations, would comply with the relationship shown in red. This is simply another way of expressing a portion of the current regulation at 25.138(a)(1).

  (In this case A = 11 dBW/40 kHz).



Application of the Allowance Mask for CDMA, FDMA or TDMA

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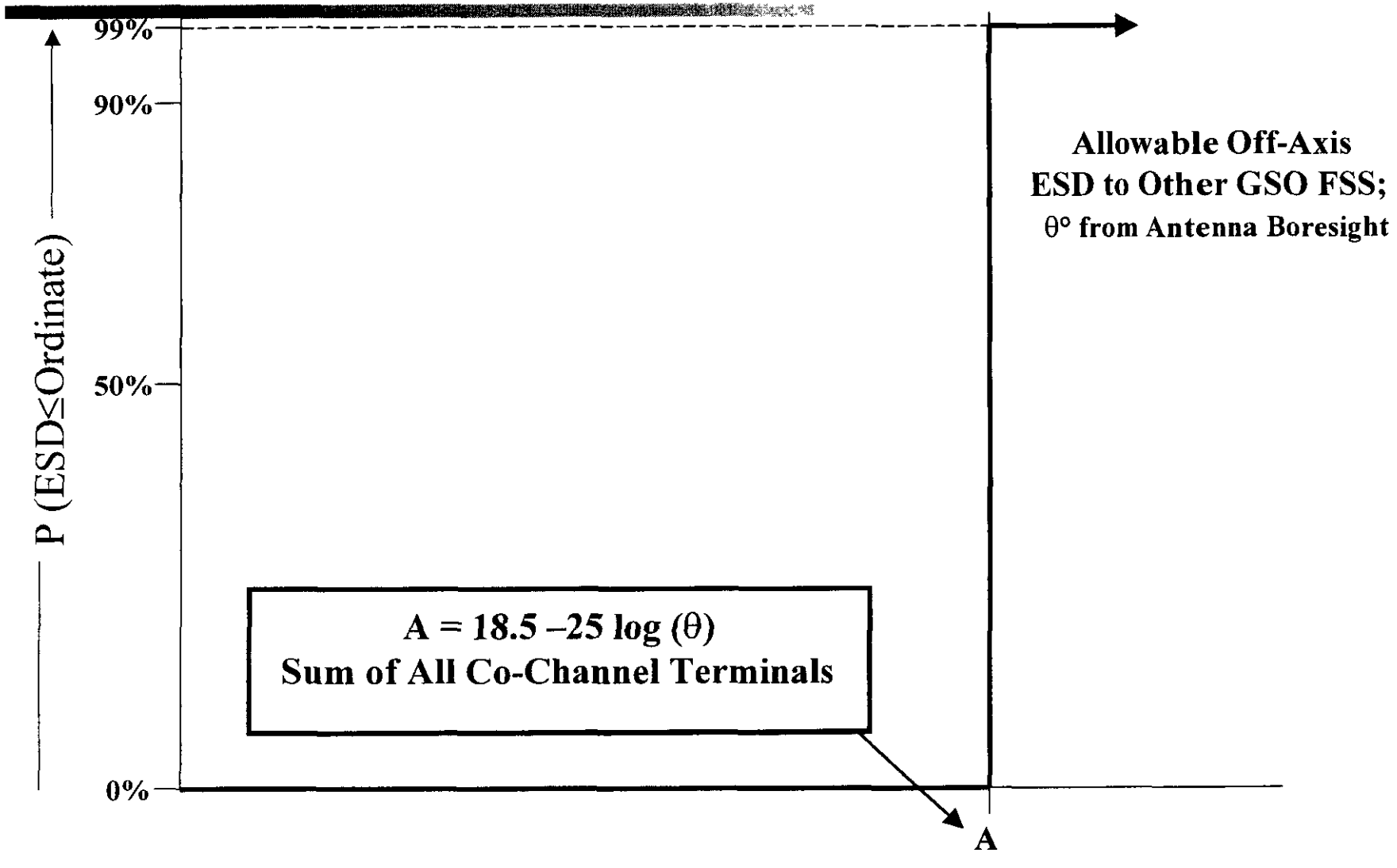
The Proposed Allowance Mask

- QUALCOMM proposes the following specific Allowance Mask, consistent with its proposals within IB Docket 00-248
  - This figure addresses and simplifies the statistical process envisioned by the FCC in the *Part 25 FNPRM*.
  - It is applicable to Aloha Contention Protocol systems.
  - It does not disadvantage TDMA, FDMA or CDMA satellite systems or Contention Protocol systems using Aloha.
  - It addresses and could be utilized to "bring into compliance" VSAT systems using contention protocols (even as we speak), although these systems are operating in the Ku-Band.



Proposed Cumulative Distribution Function

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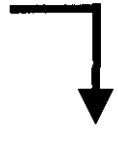
Exceedance Duration

- A new rule must address the maximum duration (in time) for which the Adjacent Satellite EIRP Spectral Density might exceed the 18.5 – 10log(θ) rule.
- One must not confuse exceedance durations with exceedance probabilities.
- The Exceedance Duration (time) should be tailored to the requirements of the victim system, given the characteristics of the particular services it is providing.



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Victim Satellite Station Data Transaction Type

Data Exchange Type:	Nature of Data:	Possible Acceptable Outage Time Due to ASI
Machine ←→ Machine	•Large Data Block Transfers	1.0 to 10 seconds
Machine ←→ Person	•Web Browsing •Video Viewing •Small File Transfers	0.1 to 1.0 second
Person ←→ Person	•Digital Voice •Various Real-Time Internet Transactions (e.g. games)	0.1 to 1.0 second

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Ka-Band Propagation Effects

- 20/30 GHz Propagation Effects (Precipitation), if Uncorrected, could Result in Outage Conditions Lasting for Seconds to Minutes.
- Even with Signal Corrections, Power Control System Time Constants will Likely be in Excess of One (1.0) Second.
- This is a Characteristic of Control Systems Where Two Way GEO Time Delays are Involved.